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Homing pigeons follow their nose

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Sailors and homing pigeons use the same navigating aid. Since ancient times the sailor has relied on the property of ‘loadstone’ a magnetic ore of iron, of aligning itself to magnetic north. A magnetic pointer, free to turn on a pivot or floating without supports could help the sailor tell the direction in the high seas.

Avian navigators

The skill of birds to tell the way has been a mystery for a long time. There are theories of long distance flyers being genetically programmed to follow the sun in given seasons, to get from Greenland to Australia. But solid evidence of a navigating mechanism has only now been nailed down by Cordula Mora and her team in Auckland, New Zealand.

The homing pigeon displays the ability to remember pathways in the air that do not seem to depend on visual signposts. For instance, pigeons can get back to their ‘home’ rooftop even when important landmarks are pulled down. They can also do it at all times of the day and when the sun shines from different direction or when it is overcast and the sun cannot be seen.

Compass in the nose

The New Zealand team has found that pigeons actually sense magnetic fields and that they do it through iron-rich materials found in their beaks. The birds were placed in a long cylinder with a food tray at both ends and an electric coil around the cylinder to create a magnetic field. The field was then created first one way and then the other and the birds were rewarded for moving the correct way by placing food on the tray at the correct end . The remarkable thing was that the birds learnt very fast, which means they could clearly sense the magnetic field. As if it were a colour of light or a pitch of sound.

But if small magnets were taped to their beaks, or if the beaks were anaesthetized, the birds did not react to changing the direction of the field. This showed that it was in the beak that the birds had their magnetic field sensing equipment.

Connecting to the brain

The Kiwi team found that the signals to the brain seem to travel along the vision portion of the ‘trigeminal’ or the 5^{th} cranial nerve, which leads from the upper beak, in birds, to the brain. They found this out by cutting the different parts of the nerve to see if the birds could still ‘smell’ magnetic fields. Cutting the other two branches of this 3-part nerve (hence ‘tri’ in its name, the other parts are of smell and of the jaw) had no effect on the magnetic sensing faculty.

These findings are in agreement with other studies that have shown that many species, the rainbow trout, bacteria, honey bees, other fish, even whales, do sense magnetic fields. Cora and her associates have are yet to locate actual crystals of iron salts in pigeon beaks but this may not be necessary as even ultra-microscopic particles could be effective. Unlike sensing with light or sound, which require signal collecting machinery, like eyes or ears, with the magnetic field, the field is everywhere and tiny sensors are affected as much as larger ones.